Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

99-RU-0464

Mr. M. J. Lawrence, Executive Vice President
General Manager TWRS Project
BNFL Inc.
3000 George Washington Way
Richland, Washington 99352

Dear Mr. Lawrence:

RADIOLOGICAL ALARA DESIGN PROGRAM INSPECTION REPORT, IR-99-004

On July 12-16, 1999, the Office of Radiological, Nuclear, and Process Safety Regulation of the TWRS-P Contractor (Regulatory Unit) completed an inspection of the Radiological ALARA Design Program at the BNFL Inc. (BNFL) facility.

The inspection team identified one Finding (documented in the Notice of Finding [Enclosure 1]). The Finding resulted from BNFL not properly implementing a commitment in the Integrated Safety Management Plan (ISMP) concerning the implementation or documentation of discipline specific ALARA design criteria and considerations during performance of design activities. In addition, the inspection team identified an ALARA design program weakness in that BNFL lacked detail in the ALARA design procedures and codes of practice. This weakness encompassed a number of programmatic problems with the ALARA design program that, if not corrected, could result in significant regulatory problems associated with the documentation of the ALARA design effort as the facility design progresses.

You are requested to provide a written response to the Finding and weakness within 30 days, in accordance with the instruction provided in the enclosed Notice of Finding. Details of the inspection, including the Finding and weakness, are documented in the enclosed inspection report (Enclosure 2).

With the exception of the Finding and weakness described above, the results of our inspection revealed that BNFL had well trained and knowledgeable staff that have documented good preliminary design discussions in some aspects of the facilities ALARA design. The inspection was limited mostly to a program review because of the preliminary nature of the facility design. A more detailed review of quantitative ALARA evaluations will be performed in future ALARA design inspections.

Nothing in this letter should be construed as changing the Contract (DE-AC06-96RL13308). If you have any questions regarding this inspection, please contact me or Pat Carier of my staff on (509) 376-3574.

Sincerely,

D. Clark Gibbs, Regulatory Official
Office of Radiological, Nuclear, and
Process Safety Regulation

RNP:JWM

Enclosures:
1. Notice of Finding
2. Inspection Report IR-99-004

cc w/encls:
D. W. Edwards, BNFL

NOTICE OF FINDING

Standard 4, "Safety, Health, and Environmental Program," of Contract DE-AC06-RL13308, dated August 24, 1998, between BNFL Inc. (the contractor) and the U.S. Department of Energy, defines the contractor's responsibilities under the Contract as they relate to conventional non-radiological worker safety and health; radiological, nuclear, and process safety; and environmental protection.

Standard 4, Section c. 2) (a) of the Contract requires the contractor to develop and implement an integrated standards based safety management program. DOE/RL-96-0003, *DOE Regulatory Process for Radiological, Nuclear, and Process Safety for TWRS Privatization Contractors,* which is incorporated by reference in the Contract, requires the integrated standards based safety management program to be documented in an Integrated Safety Management Plan (ISMP) which is reviewed and approved by the Regulatory Unit. Standard 4, Section b., and DOE/RL-96-0003, Section 3.3.1, establish that the contractor during Part B of the contract shall implement the ISMP.

During the performance of an inspection of radiological as low as is reasonably achievable (ALARA) design program activities at the offices of the contractor's River Protection Project Privatization (RPP-P) program, the Regulatory Unit identified the following:

1. ISMP, Section 3.9.2, "ALARA Design," and procedure K70P502B_0, "Application of ALARA in the Design Process," Step 5.1, requires the design engineers to implement and document discipline-specific ALARA criteria and considerations in their work.

   Contrary to this requirement, the inspectors found during the week of July 12-16, 1999, that the contractor had not implemented or documented discipline specific ALARA design criteria and considerations during performance of design activities.

   This is considered an inspection Finding.

The contractor is requested to provide to the Regulatory Unit within 30 days of the date of the cover letter that transmitted this Notice, a reply to the Finding described above. The reply should include: (1) admission or denial of the alleged Finding, (2) the reason for the Finding, if admitted, and if denied, the reason why, (3) the corrective steps that have been taken and the results achieved, (4) the corrective steps that will be taken to avoid further Findings, and (5) the date when full compliance with the applicable commitments in your authorization base will be achieved. Where good cause is shown, consideration will be given to extending the requested response time.

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U.S. DEPARTMENT OF ENERGY

Richland Operations Office
Office of Radiological, Nuclear, and Process Safety Regulation
of the TWRS-P Contractor

INSPECTION: RADIOLOGICAL ALARA DESIGN PROGRAM

REPORT NO: IR-99-004

FACILITY: BNFL Inc.

LOCATION: 3000 George Washington Way
Richland, Washington 99352

DATES: July 12-16, 1999

INSPECTORS: J. McCormick-Barger (Lead), Senior Regulatory Technical Advisor
J. Polehn, DOE
E. Bradley, Radiation Protection Consultant
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APPROVED BY: Pat Carier, Verification and Confirmation Official
Office of Radiological, Nuclear, and Process Safety Regulation

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EXECUTIVE SUMMARY
Radiological ALARA Design Program

Inspection Report Number IR-99-004

INTRODUCTION

This inspection of the BNFL Inc. (the contractor) Radiological ALARA Design Program covered the following specific areas:

- ALARA Design Program Review (Section 1.2)
- Design and Material Selection (Section 1.3)
- Airborne Radioactive Material Control (Section 1.4)
- Personnel Exposure Control (Section 1.5)
- Area, Air, and Nuclear Accident Monitoring (Section 1.6)
- Waste Handling, Packaging, Storage, and Shipping Facilities (Section 1.7)
- Minimization of Radioactive Waste Generation (Section 1.8)
- Radioactive Solids, Liquids, and Gaseous Effluent Releases (Section 1.9)
- Review of Contact Maintenance Design Change Package (Section 1.10)

SIGNIFICANT OBSERVATIONS AND CONCLUSIONS

- There were ALARA procedures, codes of practice, and records to document the activities of the ALARA design program. The staff were found to be trained and knowledgeable of ALARA design concepts and the program. The active use of ADR records (over 70 records generated to date) was considered a positive indication of ALARA design activities being implemented. (Section 1.2)

- A Finding was identified for failure to implement discipline specific design criteria and considerations and a weakness was identified for the lack of detail in ALARA design procedures and codes of practice. This weakness encompassed a number of programmatic problems with the ALARA design program that, if not corrected, could result in significant regulatory problems associated with the documentation of the ALARA design effort as facility design progresses. (Section 1.2)

- With the exception of the weakness identified above, key elements of the ALARA Design Program were in place to ensure that ALARA design concepts were considered during the design of the facility. However, because of the preliminary status of the facility design, no qualitative or quantitative design information was available for evaluation at the time of the inspection. (Sections 1.3-1.9)

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RADIOLOGICAL ALARA DESIGN PROGRAM

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RADIOLOGICAL ALARA DESIGN PROGRAM INSPECTION REPORT

1.0 REPORT DETAILS

1.1 INTRODUCTION

In accordance with the Tank Waste Remediation System-Privatization (TWRS-P) Contract (Contract, DE-AC06-96RL13308 between DOE and BNFL (the contractor), dated August 24, 1998) and specifically 10 CFR 835, *Occupational Radiation Protection*, (required by Standard 4, Section c.2)(b)) the contractor was required to conduct activities in compliance with a documented Radiation Protection Program (RPP) that addresses the requirements in 10 CFR 835. This requirement was reflected in the contractor's RPP Revision 2, dated June 1, 1999.

The inspectors reviewed the contractor's ALARA design performance against the RPP and implementing procedures to determine if the contractor was designing the River Protection Project-Privatization (RPP-P) Waste Treatment Plant (WTP) in accordance with the ALARA principals required by the Contract, authorization basis, and 10 CFR 835.

1.2 ALARA DESIGN PROGRAM REVIEW (INSPECTION TECHNICAL PROCEDURE (ITP) I-111)

1.2.1 Inspection Scope

The inspectors reviewed the contractor's ALARA design program, procedures, and training, and interviewed selected design staff to assess the contractor's ability to appropriately incorporate ALARA design requirements into the facility design at the current stage in the design process. Particular attention was placed on verifying that ALARA design criteria, identified in the contractor's Radiation Protection Program for Design (RPP), were incorporated in implementing procedures, ALARA training, and design efforts, and that staff were knowledgeable of the ALARA design program. In addition, the inspectors reviewed ALARA design records to determine if ALARA design efforts were being appropriately documented in accordance with 10 CFR 835.701(a) and 10 CFR 835.704(b).

1.2.2 Observations and Assessments

During assessment of the ALARA design program, the inspectors reviewed the following documents:

- Radiation Protection Program for Design (RPP)(BNFL-TWP-SER-003, Rev. 2, June 1, 1999)

- Safety Requirements Document (SRD)(BNFL-5193-SRD-01, Rev. 2, December 2, 1998, February 9, 1999)
- Integrated Safety Management Plan (ISMP) (BNFL-5193-ISP-01, Rev. 4, December 2, 1998)
- Procedure K70P502B_0, "Application of ALARA in the Design Process," 5/99
- Code of Practice K70C530B_0, "Code of Practice for ALARA in Design," 03/12/1999
- Code of Practice K70C013_0, "Code of Practice for Design Review Meetings," 11/98
- Procedure K72B510_0, "ALARA Design Review Record," 11/98
- Procedure K70P526A_1, "Project Safety Committee," 7/99
- Environmental Health and Safety (EH&S) Policy No. PS06-H-0002.3, "Occupational Radiation Protection"
- Corporate Safety, Health and Environmental Manual (CSHEM), Code of Practice No. 20, "Application of ALARP [As Low as is Reasonably Practicable] to the Routine Radiation Exposure of Workers and the Public"
- Training Lesson Plan, ALARA - ALARA – 0001-01
- A number of ALARA Design Review (ADR) Records.

1.2.2.1 ALARA Design Criteria Review

The inspectors noted that the general radiological/ALARA design criteria identified in the RPP, Section 5.5.10, "ALARA Design Criteria," and in the SRD, Chapter 5.0, "Radiation Protection," were compiled and listed in K70C530B_0, "Code of Practice for ALARA in Design," Section 3.0, "ALARA Design Criteria." This code of practice listed 14 general criteria, 7 dose criteria, and 10 environmental criteria. The inspectors noted that almost all of the RPP and SRD general ALARA design criteria were quoted verbatim except for SRD Safety Criteria 5.1-5 and 5.3-7. The inspectors discussed these apparent omissions with contractor staff and concluded that the ALARA design criteria of Safety Criterion 5.1-5 was adequately covered by the ALARA design criteria of Safety Criterion 5.3-3 and that the ALARA design criteria of Safety Criterion 5.3-7 was adequately covered by the ALARA design criteria of Safety Criterion 5.3-6. The "Note" to Safety Criterion 5.3-7 stated that "The TWRS-P design does not include provisions for liquid waste discharges, other than sanitary sewer discharges," which justified the exclusion of the criteria associated with liquid waste discharges. Therefore, the inspectors determined that the general ALARA Design Criteria listed in the RPP and SRD were appropriately captured in the code of practice.

The inspectors conducted a review of implementing procedures, to determine if the authorization bases ALARA design requirements were appropriately incorporated in the implementing procedures and were being considered during design as required. The inspectors noted that the contractor's authorization basis made clear commitments to implement ALARA into design work through procedures and codes of practice (RPP, Section 5.5.6, "Plans and Procedures," and ISMP, Section 3.9.2, "ALARA Design"). The inspectors noted that ISMP, Section 3.9.2, "ALARA Design," and procedure K70P502B_0, "Application of ALARA in the Design Process," Step 5.1, required the design engineers to implement and document discipline-specific ALARA criteria and considerations in their work. The ISMP also required the discipline supervisor to ensure that individuals in the group are trained in the discipline-specific ALARA criteria and considerations, and to review discipline designs against those criteria and consideration(s). The inspectors then reviewed the above listed contractor procedures and codes of practice to determine if there were any instructions for the designers to utilize the general ALARA design criteria listed in K70C530B_0, "Code of Practice for ALARA in Design," and discipline specific ALARA criteria and considerations in their design efforts or in the reviews of their design. The inspectors found two ALARA design review checklists in K70P502B_0, "Application of ALARA in the Design Process," and a checklist of questions in K70C013_0, "Code of Practice for Design Review Meetings;" however, these lists did not include the ALARA general design criteria of K70C530B_0, nor did they contain discipline-specific ALARA criteria and considerations. The inspectors found no objective evidence in the procedures or codes of practice that would cause the designers to utilize the general ALARA design criteria listed in K70C530B_0 or discipline-specific ALARA criteria and considerations required by the ISMP in their designs, review of designs, or documentation of their designs and design reviews. The lack of discipline specific ALARA design criteria and considerations is considered an inspection Finding (IR-99-004-01-FIN).

1.2.2.2 ALARA Training

The inspectors conducted a review of the ALARA training module. The ALARA training module was scheduled as a 2-hour training class consisting of 22 slides, a 63-page handout (ALARA Design Guidance), and a self-corrected test of 10 questions. The ALARA Design Guidance handout identified K70C530B_0 as a reference that contained ALARA guidance, but there was no reference in the training module to the ALARA design criteria. The ALARA Design Guidance handout contained a 13-page ALARA items checklist; however, this checklist did not include the discipline specific or general ALARA design criteria. The inspectors selected a random sample of names of design engineers to verify, through training record review, that they had obtained the mandatory ALARA training. All staff verified had received the ALARA training.

The inspectors held interviews with a number of contractor staff involved in design efforts. The interviewed staff included the lead mechanical engineers and lead layout specialists responsible for the design of the four major process areas as well as the ALARA lead (i.e., Shielding and Dose Assessment Lead). These four major process areas included the Pretreatment building, the HLW Vitrification building, the LAW Vitrification building, and the Balance of Facility (including support and administrative) buildings and facilities. During the interviews, the mechanical engineering and layout specialists were found capable and experienced. These

individuals typically had experience with designing or operating vitrification facilities in the U.K. or the U.S., and could draw upon their knowledge in ways that were beneficial to the overall ALARA design process. The contractor's staff that were interviewed remembered that they had received ALARA training, knew the appropriate procedures and codes of practice to use in the ALARA design phase, and knew the appropriate staff within the Shielding and Dose Assessment group to contact regarding ALARA design issues. However, most of the staff interviewed were not aware of general or discipline specific ALARA design criteria.

With the exception of the issue concerning the identification of general and discipline specific ALARA design criteria, staff appeared to have been adequately trained and knowledgeable of ALARA design considerations.

1.2.2.3 ALARA Design Program Procedure Review

During the course of reviewing the authorization basis for ALARA design requirements, the inspectors noted that RPP, Section 5.5.1, ALARA Policy/Management Commitment," was a restatement of the EH&S Policy No. PS06-H-0002.3, "Occupational Radiation Protection." The inspectors also noted that ISMP, Section 3.9.2, "ALARA Design," referenced the CSHEM, Code of Practice No. 20, "Application of ALARP to the Routine Radiation Exposure of Workers and the Public," and that much of this document was incorporated into the contractor's RPP. Section 4.1 of this CSHEM code of practice stated that "Management commitment must exist and be clearly visible in order to translate the regulatory objective of ALARP into reality." The inspectors noted that although EH&S Policy No. PS06-H-0002.3 was listed as a reference in the ALARA training module, it was not included in the ALARA Design Guidance handout, posted in any of the contractor engineering work areas, nor provided to employees in the "Safety Handbook" as required by the CSHEM.

During the course of reviewing the ALARA design review requirements of the Project Safety Committee (PSC) and the ALARA Subcommittee (ASC), the inspectors noted that the Chairperson or Deputy Chairperson of the PSC was required by procedure K70P526A_1, "Project Safety Committee," to appoint one of the PSC members on the ASC to serve as the Subcommittee Chairperson. However, contrary the contractor's procedure, the appointed chairperson of the ASC was not currently, nor had ever been, a member of the PSC.

Also during the course of reviewing the above listed documents, the inspectors noted that the terms "ALARA concepts," "ALARA design goal," "ALARA principles," "principles of ALARA design and operation," and "ALARA considerations" were used but not defined in any of the documents reviewed. The inspectors also noted inconsistencies in the use of the terms Radiation Protection Program, radiation protection program, and Radiological Controls Program.

During the review of the ALARA program procedures and codes of practice and associated ALARA records, the inspectors found the procedures and codes of practice to lack specific detail to ensure that ALARA design requirements were being systematically implemented and documented as required by the ISMP, RPP, and 10 CFR 835. The ALARA Design Review (ADR) records reviewed, reflected the lack of appropriate guidance in that they did not

consistently document (particularly the ALARA criteria being considered) appropriate details of the ALARA reviews being performed as required by 10 CFR 835.704(b).

The following are examples of some of these weaknesses.

Procedures:

- Procedure K72B510_0, dated 11/98, "ALARA Design Review Record," lacked detail concerning how to document ALARA assessments. For example, the three-step procedure did not:

  - Specify the requirement to document discipline-specific criteria or considerations that were to be evaluated as required by the "Integrated Safety Management Plan" (Section 3.9.2) and the "Application of ALARA in the Design Process" procedure (K70P502B_0, dated 5/99);

  - Specify who can initiate or approve the record;

  - Specify who should be provided copies of the record;

  - Specify how actions identified on the record were to be tracked and verified to be complete;

  - Specify how the records are tied to the specific design for later retrieval and evaluations.

- The "Design Change Control" (DCC) Procedure (K70P030_2, dated 3/99) required a "Design Change Application" (DCA) or "Design Change Note" (DCN) to manage and control changes to all approved design documents and drawings to ensure the integrity of the authorization basis and to control cost, schedule, and scope. However, the procedure did not specify the conduct of an ALARA design review when the design change could negatively, or positively, affect the ALARA design. The inspectors subsequently determined that this issue had been identified in an "Improvement and Suggestion" form (number 003769, dated 5/10/99) and that the contractor was taking action to revise the DCC procedure to reflect the need to perform an ALARA evaluation on DCAs/DCNs that may have an impact on the ALARA design. This issue will be tracked as an inspection follow-up item (IR-99-004-02-IFI).

- The "Code of Practice for ALARA in Design" (K70C530B_0) contained a comprehensive list of ALARA design criteria (reflected from the Radiation Protection Plan), but there was little in the procedure that directed the staff to use the criteria during design activities.

- Although the ALARA Design Guide provided to staff during training was a useful guide, it was not referenced in ALARA procedures or codes of practice.

- The ALARA Design Review Record procedure (K72B510_0) identified that the producer of the record will be a multi-disciplinary team. However, reviews of completed ADR records indicated that the record was not always generated as a result of multi-disciplinary team reviews, but rather as a result of individual reviews. Also, the membership of the multi-disciplinary team could not be determined by review of the ADR records.

Records:

- The ADR records reviewed resulted in the identification of a number of actions that had no clear link to the design activity. For example:

  - The records were assigned a sequential ADR number not unique to the design;

  - The "system" field often contained a generic description and did not refer to the building, area, or other unique identifier;

  - Although actions were identified that were important to the final conclusion, there was no tracking or closure mechanism to ensure the action had been or will be completed.

- Some ADR records were not distributed to anyone and others were provided to individuals or organizations.

- An ADR record had an action in the scope of the ADR in addition to actions in the Action Section.

- Some ADR records had numbers on the ADRs that were different from the ALARA summary report. This could cause confusion in the future during record recovery.

- Some ADR records had attachments but the attachments were not referenced on the ADR and in some cases, those attachments referenced attachments that were not attached.

The lack of detail in ALARA design implementation procedures as described above, represented a weakness in the contractor's ALARA design program and is another example of the procedural weakness identified in the Quality Assurance inspection documented in IR-99-002. Resolution of the procedural problems described above will be tracked as an inspection follow-up item (IR 99-004-03-IFI).

1.2.3 Conclusions

The inspectors observed that there were ALARA procedures, codes of practice, and records to document the activities of the ALARA design program. The staff were found to be trained and knowledgeable of ALARA design concepts and the program. The active use of ADR records (over 70 records generated to date) was considered a positive indication of ALARA design activities being implemented. However, the inspectors identified one Finding for failure to

implement discipline specific design criteria and considerations and a weakness for the lack of detail in ALARA design procedures and codes of practice.

The weakness encompassed a number of programmatic problems with the ALARA design program that if not corrected could result in significant regulatory problems associated with the documentation of the ALARA design effort as facility design progresses.

1.3 DESIGN AND MATERIAL SELECTION (ITP I-111)

1.3.1 Inspection Scope

The inspectors reviewed the contractor's selection of materials and design of the facility to determine if radiation exposure reducing features were being considered that would facilitate activities involving conduct of operations, maintenance, decontamination, and decommissioning of the facility with radiation exposures being maintained ALARA as required by 10 CFR 835.1002(d).

1.3.2 Observations and Assessments

As described in Section 1.2.2, the inspectors interviewed the lead mechanical engineers and lead layout specialists responsible for the design of the four major process areas. When specifically asked about the selection of construction materials and equipment and the overall design of the facility, the staff responded that only initial discussions had occurred because of the preliminary nature of the facility design (facility general layout). However, several significant discussions had been conducted between various design groups concerning equipment selection, shield wall construction, remote sampling system design, and hands-on maintenance activities and methodologies. Group leaders clearly indicated that they understood the potential concerns and problems associated with designing a facility with the source term expected for the facility. At this stage of the design process (Phase 1) only general building layout, conservative shield thickness, equipment room dimensions, and major component placement had been discussed to any extent. As the contractor proceeds through the design process, more detailed design drawings with equipment placement and shielding values is expected.

The inspectors conducted a more detailed evaluation of the ALARA program associated with the design of the four major process areas involved in the contractor's project (High Level Waste (HLW) Vitrification; Low Activity Waste (LAW) Vitrification; Pretreatment (PT); and Balance of Facility (BOF)). This evaluation included discussions with the lead design engineers for the four major areas of the facility and the lead design engineer for the remote process sampling system to be installed in the PT, HLW, and LAW facilities.

Further, review of the early stage of facility design was made using procedure K72B510_0, "ALARA Design Review Record," and code of practice K70C530B_0, "Code of Practice for ALARA in Design." The code of practice described a process to ensure that ALARA design considerations were continuously reviewed as the design developed, and provided for formal ALARA reviews. The purpose of the ALARA design reviews in the early stages of design was

to focus on plant layout and the evaluation of conceptual process designs. The ALARA design reviews were documented in accordance with K71B510_0, and included the use of an ALARA Design Review (ADR) record (form K13F019) to record the results of the reviews. The inspectors then obtained an ALARA summary listing of the recorded ADR records on file from the Shielding and Dose Assessment lead. The inspectors chose a representative group of ADRs for detailed evaluation concerning the contractor's ALARA design program, as applied during the early phase of facility design.

The inspectors evaluated ADR-99-00015, "HLW Vitrification Building General Layout," R-0 (April 1999). The Shielding and Dose Assessment group developed this ADR to record the initial review of Phase 1-design drawings (DWG-W375-HV-PL00001 through -PL00013). Extensive comments were documented as a result of this review concerning contamination and radiation zone classifications, waste handling patterns, layout of decontamination facilities, and other facility aspects as it pertained to conducting operations in an ALARA fashion. Because of the preliminary nature of this record, no quantified ALARA evaluations were conducted and it was noted that future dose reductions would depend on the results of further ALARA design efforts.

The inspectors evaluated ADR-99-0030, "System 330 (Decontamination) Description Review," R-0, (April 5, 1999). The Shielding and Dose Assessment group developed this ADR, to record their initial comments on the LAW container decontamination process system. Again, because of the preliminary nature of this record, no quantified ALARA evaluations were conducted.

The inspectors also evaluated two Design Change Applications (DCA) for incorporation of ALARA attributes in design, operations, maintenance, and decommissioning. The design changes were processed in accordance with procedures K70C003_0, "Code of Practice for Design Change Control," and procedure K70P030_2, " Design Change Control."

The first DCA evaluated by the inspectors was DCA-W375-99-00054, "Relocation of Facilities from the Administration Building to the Process Buildings (PT, LAW, HLW). The contractor had determined that a significant amount of potentially contaminated space could be removed from the processing area by moving the administration building and deleting personnel access corridors (bridges) from the design concept. The moving of the administration building outside the radiologically controlled area was expected to eliminated unnecessary administrative personnel radiation exposure and reduce potentially contaminated and radiologically control areas by approximately 58,000 square feet. Again, because of the preliminary nature of the design, no quantified ALARA evaluations were conducted on this design change.

The second DCA evaluated (DCA-W375-99-00008, "LAW Vitrification Hands-on Maintenance") is addressed in Section 1.10 of this report. This DCA relates to the contractor's evaluation of the benefits of conducting some hands-on maintenance in the LAW facility for a possible authorization basis change. This design change called for the review of additional shielding in selected areas to allow hands-on maintenance in lieu of remote equipment handling due to the lower than expected source term for the vitrified LAW.

1.3.3 Conclusions

With the exception of the administrative procedural weakness identified in Section 1.2.2, the inspectors found that key elements of the ALARA Design Program as it related to design and material selection were in place. However, because of the preliminary status of the facility design, no qualitative or quantitative design information was available for evaluation at the time of the inspection.

1.4 AIRBORNE RADIOACTIVE MATERIAL CONTROL (ITP I-111)

1.4.1 Inspection Scope

The inspectors reviewed the design of the confinement and ventilation systems to verify that the systems provided the required level of protection from airborne contamination, giving particular attention to patterns of air flow, and to the location of the air inlets and exhaust ports, and other penetrations. In accordance with 10 CFR 835.1002(c), releases of radioactive material to the workplace were to be avoided under normal operating conditions, and inhalation of such material by workers were required to be controlled to the extent reasonably achievable.

1.4.2 Observations and Assessments

The inspectors interviewed selected design staff that were assigned responsibility for, among other things, design of confinement and ventilation systems. When specifically asked about ALARA aspects associated with the design of the confinement and ventilation systems, the staff responded, as in Section 1.3.2, that only initial discussions had occurred because of the preliminary nature of the facility design. However, they also indicated that they understood the potential concerns and problems associated with designing confinement and airflow systems, and that they had held initial design team meetings on this subject.

From the ALARA summary listing of ADRs described in Section 1.3.2, the inspectors identified several records that related to the design of the confinement and ventilation systems. The first ADR record evaluated was ADR-99-00018, “HLW Vitrification Building Ventilation Air Flow Diagram” (March 25, 1999). This ADR was developed by the Shielding and Dose Assessment group to record the initial discussions among project staff regarding the establishment of the proper airflow pattern, and moving air from areas with low contamination levels into areas with higher contamination levels. Because of the preliminary nature of this record, no quantified ALARA evaluations were conducted and it was noted that future dose reductions would depend on the results of additional ALARA design efforts.

The second ADR evaluated by the inspectors was ADR-99-0022, “HLW Vitrification Building Ventilation Air Flow Diagram” (April 5, 1999). The Shielding and Dose Assessment group developed this ADR to record their comments on the initial Air Flow Diagram for the HLW building. This ADR referenced the appropriate ALARA Design Guide and ALARA Items Checklist, although it appeared to be too early in the design process to fully apply this

information. Again, because of the preliminary nature of this record, no quantified ALARA evaluations were conducted.

The third ADR evaluated was ADR-99-0023, "LAW Building HVAC [Heating, Ventilation and Air Conditioning] Zone Diagram" (April 5, 1999). The Shielding and Dose Assessment group developed this ADR to record their initial comments on the initial Air Flow Diagram for the LAW building. The ADR record noted some inconsistencies with the airflow from C3 to C2 areas and referenced the appropriate ALARA Design code of practice (K70C530).

The inspectors did not encounter any ALARA design information regarding the location of the air inlets and exhaust ports, and other penetrations, and avoiding releases of radioactive material to the workplace under normal operating conditions and inhalation of such material by workers, because of the early stage of facility design.

1.4.3 Conclusions

As with other aspects of the ALARA design program, the inspectors found that the contractor had appropriately considered initial ALARA design elements during the early phase of the design of the confinement and ventilation systems. However, because of the preliminary status of the facility design, no quantitative design information was available for evaluation.

1.5 PERSONNEL EXPOSURE CONTROL (ITP I-111)

1.5.1 Inspection Scope

The inspectors assessed the adequacy of the contractor's design for controlling personnel exposure from external sources of radiation per the design objectives of 10 CFR 835.1002(b).

1.5.2 Observations and Assessments

The inspectors noted that the contractor committed to 10 CFR 835.1002(b) in the RPP, Section 5.5.10, "ALARA Design Criteria," items 5.5.10.9 and 5.5.10.10. In addition, Section 5.5.1, "ALARA Policy/Management Commitment," stated that "BNFL Inc. ensures that radiation exposures to its workers are maintained below regulatory limits and efforts are made to further reduce exposures ALARA."

The inspectors looked for the implementation of this regulatory requirement in contractor procedures, codes of practice, and training. The inspectors noted that the radiological/ALARA design criteria identified in the RPP, Section 5.5.10, "ALARA Design Criteria," and in the SRD, Chapter 5.0, "Radiation Protection," are compiled and listed in K70C530B_0, "Code of Practice for ALARA in Design," Section 3.0, "ALARA Design Criteria." The inspectors noted that ALARA Design Criteria 3.2.7 established radiation area classifications (R1 through R5) that identify target and maximum dose equivalent rates to guide designers. The inspectors reviewed the ALARA training module and noted that the requirements of 10 CFR 835.1002(b) were

included in the ALARA training lesson plan and included in the ALARA Design Guidance handout.

As stated in Section 1.2.1, the inspectors found that, although K70C530B_0 contained the ALARA criteria associated with 10 CFR 835.1002(b), there were no objective evidence that the procedures or codes of practice would cause the designers to use the criteria to ensure that the requirements of 10 CFR 835.1002(b) were incorporated into their design, reviews of designs, or documentation of their designs and reviews of designs. This procedural problem was discussed in Section 1.2.2.3 as an example of a program weakness.

1.5.3 Conclusions

The contractor developed ALARA design criteria that addressed the requirements of 10 CFR 835.1002(b) concerning personnel exposure control. The use of the Radiological Classification (zones R1 through R5) to provide reasonable assurance that the dose limits of 10 CFR 835 would be met, was an adequate measure of control during this phase of design. Although the contractor will not be performing quantitative dose assessments until later in the development of the design, interviews with design engineers indicated that occupational exposures to workers are being considered at this stage of design. An example of the program weakness discussed in Section 1.2.2 was identified regarding lack of procedural guidance concerning the implementation of the ALARA design criteria.

1.6 AREA, AIR, AND NUCLEAR ACCIDENT MONITORING (ITP I-111)

1.6.1 Inspection Scope

The inspectors assessed the adequacy of planned radiation monitoring against the requirements in 10 CFR 835.403, and nuclear criticality safety instrumentation against the requirements in 10 CFR 835.1304(b), including whether proposed instrumentation was appropriate for the expected types and intensities of radiation, and whether it had sufficient redundancy and capability for operation under normal operating conditions and in emergencies.

1.6.2 Observations and Assessments

The inspectors reviewed the applicable procedures and codes of practice concerning radiation monitoring. In addition, the inspectors interviewed selected contractor staff, including the lead mechanical engineers and lead layout specialists responsible for the design of the four major process areas. When specifically asked about the design of the planned radiation monitoring and nuclear criticality safety instrumentation, the staff interviewed responded that only initial discussions had occurred because of the preliminary nature of the facility design. However, they indicated that they understood the importance of such equipment and that it was essential to assuring protection of the work-force. In two cases, the staff conducted initial design team meetings on this subject to identify the appropriate criteria to be considered during the design effort. These meetings were documented using ADR records. The inspectors obtained these

ADR records, understanding that they contained preliminary, qualitative information developed during the early phase of facility design.

The first record that the inspectors reviewed was ADR-98-0002, "Locating Air Monitors/Samplers for Occupational Monitoring" (December 28, 1998). This ADR was developed by the Shielding and Dose Assessment group and included a technical document that contained support information identified in the SRD from ANSI Standard N13.1, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities" (1969), and from a BNFL Design guide on the same subject (NF-008216). The documentation described how to obtain breathing zone samples, and how to conduct actual breathing zone measurements for calibration purposes. The ADR did not include an ALARA evaluation because of the preliminary nature of the design, but it did document the initial technical discussions on this subject.

The second ADR reviewed was ADR-99-00011, "Review of Draft Specification for the Radiation Surveillance System (RSS)" (February 12, 1999). This ADR was developed by the Shielding and Dose Assessment group and included an overview of information useful for: determining the location of a central control room for emergency conditions; establishing building evacuation routes during emergencies; measuring airborne activity levels in areas, ducts, and stacks; determining gamma levels in the workplace; determining contamination area access status; establishing communications with the Hanford Emergency Notification system; and developing draft system block diagrams. The ADR did not include an ALARA evaluation because of the preliminary nature of the design.

1.6.3 Conclusions

With the exception of the administrative procedural weakness identified in Section 1.2.2, the inspectors found that the key elements of the ALARA Design Program appear to be in place, including initial use of the ADR process to document initial technical discussions that will ultimately be related to area, air, and nuclear accident monitoring. The inspectors found no evidence that the final design of the area, air, and nuclear accident monitoring systems would not ensure ALARA. However, because of the preliminary status of the facility design, no quantitative design information was available for evaluation.

1.7 WASTE HANDLING, PACKAGING, STORAGE, AND SHIPPING FACILITIES (ITP I-111)

1.7.1 Inspection Scope

The inspectors reviewed the contractor's preliminary efforts to incorporated suitable ALARA considerations into the facility design for the storage, handling, packaging and shipping of normal plant solid radioactive wastes.

1.7.2 Observations and Assessments

As discussed in earlier sections of this report, the contractor established a set of codes of practice and procedures addressing ALARA design expectations during the design phase of the RPP-P facility. After reviewing these procedures and other applicable ALARA design program documentation, and interviewing selected design staff, the inspectors determined that the contractor's program for addressing ALARA design efforts in the area of waste handling, packaging, storage, and shipping was generally in place and functional. Because of the preliminary phase on design, specific ALARA design activities in this area were limited. The inspectors reviewed the ALARA summary listing of ADRs to determine if any related ALARA design reviews had been documented to date. The ADR listing included several records that related to the design of specific processing areas and mentioned in general terms the need for more discussion on ensuring that the processing areas have the capability for handling and packaging routine wastes from operations. One ADR, "Spent Ion Exchange Resin Disposal (ADR-W375-99-0017, R-0, March 22, 1999), discussed the need for a dedicated area for the dewatering, container sealing, and decontaminating/surveying associated with the processing of the used resins. However, at this point in the design process, specific solid waste handling facilities have not been identified.

The largest amount of waste expected to be generated (other than the vitrified waste) would be the periodic removal of the LAW melters. The removal, packaging, and shipment of both HLW and LAW melters and the vitrified waste are an integral part of the facility design for each process area.

1.7.3 Conclusions

With the exception of the administrative procedural weakness identified in Section 1.2.2, the inspectors found that the contractor's ALARA design program included elements that address solid waste handling, packaging, storage, and shipping. However, because of the preliminary status of the facility design, little effort has been expended in this area and no qualitative design information was available for evaluation at the time of this inspection.

1.8 MINIMIZATION OF RADIOACTIVE WASTE GENERATION (ITP I-111)

1.8.1 Inspection Scope

The inspectors assessed the adequacy of design features used to minimize the generation of radioactive waste.

1.8.2 Observations and Assessments

The inspectors reviewed the contractor's ALARA design program as it relates to radioactive waste generation and noted that the RPP, Section 5.5.1, "ALARA Policy/Management Commitment" stated that the contractor will "Incorporate dose/contamination/waste reduction

and minimization features into new facility designs." The SRD, Safety Criterion 5.3-3 stated that "A waste management program shall ensure compliance with all applicable laws and regulations. The waste management program shall also ensure that the radiological impact to the general public and environment due to radioactive waste arising from TWRS-P Facility operation shall be ALARA."

The inspectors looked for implementation of the authorization basis requirement in procedures, codes of practice, and training as described in Section 1.2.2 of this report. The inspectors noted that the requirements of SRD Safety Criterion (SC) 5.3-3 are captured in code of practice K70C530B_0, Section 3.0, "ALARA Design Criteria."

The inspectors reviewed the applicable procedures and codes of practice to determine if there were any instructions for the designers to consider the requirements of SRD SC 5.3-3 in their design efforts or in the reviews of their design. The inspectors reviewed the two ALARA design review checklists in K70P502B_0, "Application of ALARA in the Design Process," and a checklist of questions in K70C013_0, "Code of Practice for Design Review Meetings." The ALARA design review checklists contained several items that would lead to reduced generation of radioactive waste. These items included source minimization in waste streams, contamination control, and reduced entries into contamination areas; however, these items were general in nature and were not specific to the ALARA design criteria provided in K70C530B_0. The checklist of questions did not contain any item that would lead a reviewer to consider reducing the generation of radioactive waste. As discussed in Section 1.2.2, the inspectors found that the contractor's administrative program lacked sufficient detail to ensure that appropriate ALARA criteria would be considered during design to minimize the generation of radioactive waste.

The inspectors conducted a review of the ALARA training module. The ALARA Design Guidance handout provided during ALARA training, contained a 13-page ALARA items checklist; however, this checklist did not include design features used to minimize the generation of radioactive waste other than through contamination control.

A cursory scan of the ALARA summary listing of ADRs did not identify any specific ADRs that appeared to address waste minimization. However, several ADRs did refer to contamination control considerations and other waste minimization techniques such as described in Section 1.7.2, above.

1.8.3 Conclusions

Although requirements for radioactive waste minimization were contained in the authorization bases and captured in the ALARA Design Criteria listed in the Code of Practice for ALARA in Design, administrative procedures did not contain adequate detail (see Section 1.2.2) to ensure that waste minimization was being implemented in the design of the facilities. From discussions with staff and review of ADR records, the inspectors identified some discussion of contamination control and other waste minimization efforts during preliminary design. At this stage of design, there were no mass balance diagrams by which the contractor could estimate quantities of radioactive waste. Therefore, at this time, there were no substantive waste

estimates available that would lead the inspectors to conclude that the contractor was meeting the design requirements for radioactive waste minimization.

1.9 RADIOACTIVE SOLIDS, LIQUIDS, AND GASEOUS EFFLUENT RELEASES (ITP I-111)

1.9.1 Inspection Scope

The inspectors assessed the adequacy of design features to control the release of radioactive material into the environment and to maintain liquid and gaseous effluents ALARA.

1.9.2 Observations and Assessments

The contractor's SRD, Safety Criterion 5.3-2 stated that "The ALARA Program shall ensure that releases of radioactive materials to the environment and exposures to the public during normal operations shall be kept ALARA and within prescribed limits." Safety Criterion 5.3-4 stated that "Equipment shall be designed and installed to monitor and maintain control over radioactive materials in gaseous and liquid effluents produced during normal operations, including anticipated operational occurrences." Safety Criterion 5.3-7 stated that "Liquid discharges from the facility, other than sanitary sewer discharges, shall comply with ALARA process requirements, be treated by the best available technology, and not result in release of settleable solids to surface waters for streams exceeding 5 pCi/g for alpha-emitting radionuclides, and/or 50 pCi/g for beta-emitting radionuclides." The inspectors acknowledged the "Note" in Safety Criterion 5.3-7 that stated that "The TWRS-P design does not include provisions for liquid waste discharges, other than sanitary sewer discharges."

The inspectors noted that the radiological/ALARA design criteria identified in the contractor's RPP, Section 5.5.10, and the requirements of SRD Safety Criteria (SC) 5.3-2, 5.3-4, and 5.3-7 were captured in K70C530B_0, Sections 3.3.1 and 3.3.3.

The inspectors conducted a review of implementation of SRD SC 5.3-2, 5.3-4, and 5.3-7 through the contractor's procedures and codes of practice. As discussed in Section 1.2.2.3 of this report, the contractor's administrative procedures lacked adequate detail to ensure that the criteria would be adequately implemented.

As described in Section 1.2.2, the inspectors interviewed selected contractor staff, including the lead mechanical engineers and lead layout specialists responsible for the design of the four major process areas. When specifically asked about the design of features to control the release of radioactive material into the environment and maintain liquid and gaseous effluents ALARA, the contractor's staff responded that only initial discussions had occurred because of the preliminary nature of the facility design. However, they indicated that they understood the importance of these features. In one case, the contractor's staff had held an initial design team meeting on this subject to help identify the appropriate radiological environmental monitoring systems to further consider during the design effort. This meeting was documented using an ADR record. The

inspectors obtained this ADR (ADR-99-00038, "System 855 – Radiological Environmental Monitoring" (May 6, 1999)), understanding that it contained preliminary, qualitative information developed during the early phase of facility design. This ADR was filed by the Shielding and Dose Assessment group, and provided a discussion of several topics including: codes and standards, regulatory requirements, functional system requirements, and system descriptions. The ADR did not include an ALARA evaluation because of the preliminary nature of the design.

1.9.3 Conclusions

As in Section 1.8.3, requirements for effluent releases were contained in the authorization bases and captured in the ALARA Design Criteria. Administrative procedures lacked detail to ensure that these criteria would be followed. At this stage in design, there were no substantive gaseous and liquid effluent estimates available that would lead the inspectors to concluded that the contractor will or will not meet the design requirements for the release of radioactive material into the environment. Interviews with design engineers indicate that effluent controls were being considered at this stage of design.

1.10 REVIEW OF CONTACT MAINTENANCE DESIGN CHANGE PACKAGE (ITP I-111)

1.10.1 Inspection Scope

The inspectors reviewed the contact maintenance design change package to verify that it properly considered ALARA design requirements as indicated in the RPP and contractor procedures.

1.10.2 Observations and Assessments

Because of recent developments during the ongoing design process for the RPP-P, the contractor filed Design Change Application (DCA) No. DCA-W375-99-00008 (March 15, 1999), "LAW Vitrification Hands-on Operations and Maintenance." The inspectors reviewed this DCA to verify that ALARA design requirements had been properly considered, as described in the RPP and contractor procedures. The requirements to file the DCA were provided in Procedure K70P030_2 (March 1999), "Design Change Control." This procedure established the basic change application form and procedures to be used when filing for a design change. The objective of this procedure was to provide a system to manage and control changes to all approved design documents to ensure the integrity of the authorization basis and to control safety, cost, schedule, and scope. In addition to requiring an approved DCA, the Procedure required the completion of an approved Design Change Note (DCN). Although changes that affect the authorization basis, safety, scope, or schedule are mentioned in a qualitative manner, the main focus this procedure was cost, with an action to produce a DCA if a change cost in excess of $5,000. The inspectors noted that there was no explicit reference to ALARA procedures or codes of practice in procedure K70P030_2, nor was there an ALARA trigger associated with the Design Change Control Procedure. The lack of procedural guidance

concerning performing an ALARA evaluation on certain DCAs was characterized as an ALARA program weakness and further described in Section 1.2.2.3 of this report.

The inspectors held an interview with the author of Application DCA No. DCA-W375-99-00008. The author was asked about the lack of specific detail in the DCA. In response, the author stated that this DCA was filed very early in the design phase and was intended only to serve as a "point of departure" to allow a more detailed assessment of the potential for hands on operation and maintenance for portions of the LAW Vitrification facility. The author indicated that this DCA would permit a much more intense design process to commence, with the subsequent development of quantitative design data. He indicated that the next step would be to develop a list of equipment and maintenance requirements to determine if contact maintenance is a viable option.

1.10.3 Conclusions

Although the inspectors initially thought that the contact maintenance design change package would contain specific ALARA design review information, a detailed review indicated that the design change was not a specific request for approval of contact maintenance. Rather, this change request was designed to allow designers to consider specific activities that might be candidates for hands on maintenance in future design work. As a result, it was too early in the design to determine if ALARA design criteria and considerations were properly applied to proposed contact maintenance activities.

2.0 EXIT MEETING SUMMARY

The inspectors presented the inspection results to members of contractor management at an exit meeting on July 16, 1999. The contractor acknowledged the observations, conclusions, and the Finding presented.

The inspectors asked the contractor whether any materials examined during the inspection should be considered proprietary information. No proprietary information was identified.

3.0 REPORT BACKGROUND INFORMATION

3.1 PARTIAL LIST OF PERSONS CONTACTED

M. J. Lawrence, Executive Vice President and General Manager
Mark Platt, Safety Program Lead
Dennis Kline, Safety and Regulatory Manager
Marsha Eades, (Inspection Liaison)
William Harrington, Sr. Radiological Engineer
Dave Pisarcik, Shielding and Dose Assessment Lead
Don Edwards, Safety and Regulatory Programs Manager

Garth Duncan, Design Manager, LAW
Janet Roth, Senior Process Engineer, BOP
J. Isherwood, Design Manager, Pretreatment
J. Isherwood, Design Manager, HLW
Paul Johnson, Process Engineer
Kevin Sump, Mechanical Engineer
Perfecto Delmendo, Senior Engineer
Nathaniel Wilson, Mechanical Engineer
Mark Myatt, Plant Layout Engineer
Fred Ancheta, Plant Layout Engineer
Paul Cavanugh, Plant Engineer

3.2 LIST OF INSPECTION PROCEDURES USED

Inspection Technical Procedure I-111, "Radiological ALARA Design Program Assessment"

3.3 LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

IR-99-004-01-FIN	Finding	Lack of discipline specific ALARA design criteria.
IR-99-004-02-IFI	Follow-up Item	Design Change procedure did not specify the conduct of an ALARA design review when the change could affect the ALARA design.
IR-99-001-03-IFI	Follow-up Item	Lack of detail in ALARA design implementation procedures (identified as an inspection weakness).

Closed

None

3.4 LIST OF ACRONYMS

ADR	ALARA Design Review
ALARA	As Low As is Reasonably Achievable
BNFL	BNFL Inc.
BOF	Balance of Facility
CFR	Code of Federal Regulations
CSHEM	Corporate Safety, Health, and Environmental Manual
DCA	Design Change Application
DCC	Design Change Control

DCN	Design Change Note
DOE	U.S. Department of Energy
HLW	High Level Waste
HR	Human Resources
HVAC	Heating, Ventilation, and Air Conditioning
ISAR	Initial Safety Analyses Report
ISMP	Integrated Safety Management Plan
ITP	Inspection Technical Procedure
LAW	Low Activity Waste
PD	Position Description
PT	Pretreatment
QA	Quality Assurance
QAO	Quality Assurance Orientation
QAP	Quality Assurance Program
QAPIP	Quality Assurance Program and Implementation Plan
QL	Quality Level
RL	Richland Operations Office
RPP	Radiation Protection Plan
RPP-P	River Protection Project-Privatization
RU	Regulatory Unit
SRD	Safety Requirements Document
T&D	Training and Development
TWRS-P	Tank Waste Remediation System Privatization
WTP	Waste Treatment Plant

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